

REMOVAL & INSTALLATION

FUEL PRESSURE RELEASE

Remove fuel cap to release fuel tank pressure. Remove relief valve cap. Relief valve is located on fuel rail. Connect fuel pressure gauge to relief valve. Release fuel into a suitable container.

COOLING SYSTEM BLEEDING

WARNING: When engine is operating, NEVER remove radiator cap under any conditions. Failure to follow instruction could damage cooling system or engine, or cause personal injury. Always wrap protective material around radiator cap to avoid injury from hot steam or hot coolant.

1. Fill cooling system with 50/50 mixture of water and coolant. Pause several minutes for circulation. Fill radiator to filler neck seat. Disconnect heater outlet hose at water pump to bleed off trapped air. Fill radiator until coolant begins to escape.
2. Connect heater outlet hose. Fill radiator until coolant is between cap seal in filler neck to 1.5" (38 mm) below cap seal. Install radiator cap. Start engine and allow to warm up. Shut engine off. Allow engine to cool. Remove radiator cap and check coolant level. Top off radiator coolant as necessary.

ENGINE

NOTE: Engine removal procedure is for engine only, without transmission attached.

Removal (Bronco & Pickup)

1. Drain cooling system and crankcase. Mark hood hinges and remove hood. Remove battery and ground cables. Disconnect EGR tube (if equipped).
2. Remove air cleaner and intake duct assembly with crankcase ventilation and carbon canister hoses attached. Disconnect radiator hoses. Disconnect transmission cooler lines (if equipped). Disconnect oil cooler lines at oil filter adapter (if equipped).
3. Disconnect power steering hoses and air injection hoses. Discharge A/C system using approved refrigerant recovery/recycling equipment (if equipped). Disconnect hoses at compressor and remove A/C condenser. Remove fan shroud, spacer, pulley and radiator. Remove generator.
4. Remove brackets for air injection pump, power steering pump, generator and A/C compressor. Disconnect oil pressure sending unit wire. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Using Spring Lock Coupling Remover (T81P-19623-G1 for 3/8" line or T81P-19623-G2 for 1/2" line), disconnect fuel supply and return lines. See **Fig. 2**.

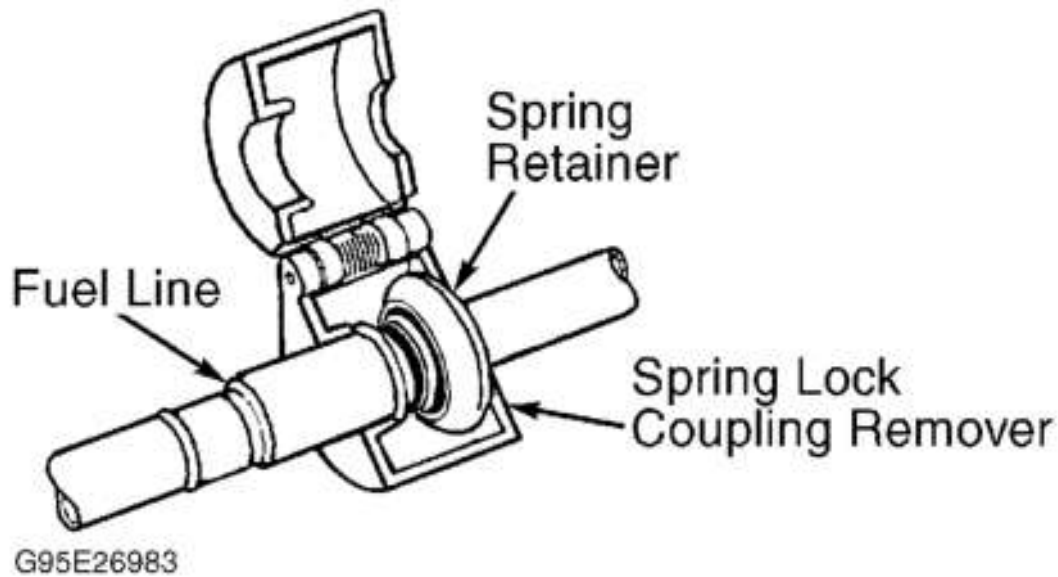


Fig. 2: Disconnecting Fuel Lines
 Courtesy of FORD MOTOR CO.

5. Disconnect accelerator cable, transmission shift rod and speed control linkages from throttle body. Remove throttle bracket from upper intake manifold, and set aside with cables attached. Disconnect vacuum lines, carbon canister hose, heater hoses and electrical wiring from engine. Disconnect primary wire at coil and brake booster hose at engine.
6. Remove engine-to-transmission upper bolts. Raise front of vehicle. Remove starter. Separate exhaust pipes from manifolds. Disconnect engine mounts from brackets on frame. On A/T models, remove torque converter inspection plate and flexplate-to-torque converter bolts.
7. On all models, remove remaining bellhousing-to-engine bolts. Lower vehicle and support transmission. Attach engine hoist and carefully separate engine from transmission. Carefully lift engine from vehicle without damaging rear cover plate.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Check and top off all engine fluids. Fill and bleed air from cooling system. See, in this article, **COOLING SYSTEM BLEEDING**.

WARNING: Disable air bag system before removing or disconnecting components. To disable air bag system, see AIR BAG RESTRAINT article in ACCESSORIES & EQUIPMENT.

Removal (Van)

1. Remove engine cover. Disconnect negative battery cable. Drain cooling system. Remove air cleaner. Remove grille and radiator air deflector. Remove headlight and side marker light assemblies. Remove fan shroud and radiator.

2. Discharge A/C system using approved refrigerant recovery/recycling equipment (if equipped), and remove A/C condenser. Remove hood latch, leaving cable attached. Remove stone deflector and upper radiator support. Disconnect air bag electrical connector. Remove heater hoses. Remove oil filler tube. Disconnect generator and junction box.
3. Disconnect lines at A/C compressor. Remove upper intake manifold. See **UPPER INTAKE MANIFOLD**. Disconnect transmission filler tube. Release fuel pressure. See **FUEL PRESSURE RELEASE**.
4. Using Spring Lock Coupling Remover (T81P-19623-G1 for 3/8" line or T81P-19623-G2 for 1/2" line), disconnect fuel supply and return lines. See **Fig. 2**. Disconnect air injection lines. Remove distributor cap, rotor and spark plug wires. Remove 3 top engine-to-transmission bolts. Raise and support vehicle.
5. Remove power steering pump hoses. Disconnect starter wiring and remove starter. Disconnect exhaust pipes from manifolds. On A/T vehicles, remove torque converter inspection cover bolts. Remove flexplate-to-torque converter nuts. Remove electrical bracket from oil pan. Remove front engine mount attaching bolts and nuts.
6. Support transmission with jack. Remove remaining engine-to-transmission bolts. Connect engine to engine hoist, and lift engine out of engine compartment.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Check and top off all engine fluids. Fill and bleed air from cooling system. See, in this article, **COOLING SYSTEM BLEEDING**.

UPPER INTAKE MANIFOLD

Removal

1. Disconnect negative battery cable. Mark and disconnect electrical connectors at upper intake components. Disconnect throttle linkage by prying with screwdriver. **DO NOT** pull off by hand. Disconnect kickdown linkage from throttle body. Remove throttle linkage cable bracket.
2. Mark and disconnect vacuum lines at upper intake. Disconnect PCV hose from rear of upper intake. On Van, remove oil filler tube. On all models, remove 2 canister purge lines from throttle body. Disconnect heater hoses attached to throttle body. Disconnect EGR tube from EGR valve.
3. Remove upper intake support bracket. Remove 6 upper intake manifold mounting bolts. Remove upper intake manifold and throttle body as an assembly. Remove intake manifold gasket.

Installation (All Models)

1. Ensure gasket mating surfaces are clean and flat. Install **NEW** gasket on lower intake manifold. If available, install 2 guide pins in opposite corners. Install upper intake manifold and tighten bolts finger tight.
2. Evenly tighten bolts to specification. See, in this article, **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. Fill and bleed air from cooling system. Refer to **COOLING SYSTEM BLEEDING**.

LOWER INTAKE MANIFOLD

Removal

1. Disconnect negative battery cable. Remove upper intake manifold. See **UPPER INTAKE MANIFOLD**. Drain cooling system. Remove distributor cap and plug wires as an assembly. Mark and remove distributor assembly.
2. Mark and disconnect electrical connectors and vacuum hoses from lower manifold. Remove fuel injector wiring harness. Release fuel pressure. See **FUEL PRESSURE RELEASE**.
3. Using Spring Lock Coupling Remover (T81P-19623-G1 for 3/8" line or T81P-19623-G2 for 1/2" line), disconnect fuel supply and return lines. See **Fig. 2**. Remove upper radiator hose, by-pass hose and heater outlet hose. Remove lower intake manifold bolts evenly. Remove lower intake manifold and gaskets.

Installation

1. Clean gasket mating surfaces. Apply a 1/16" (1.6 mm) bead of silicone rubber sealer on full width of each intake manifold seal (4 places). Install NEW lower intake manifold gaskets on cylinder block and heads.
2. Ensure gaskets are interlocked with end rubber gaskets. Install 2 guide pins in opposite corners. Install lower intake manifold and tighten bolts finger tight. Tighten bolts evenly in sequence to specification. See **Fig. 3**. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. Fill and bleed air from cooling system. See **COOLING SYSTEM BLEEDING**.

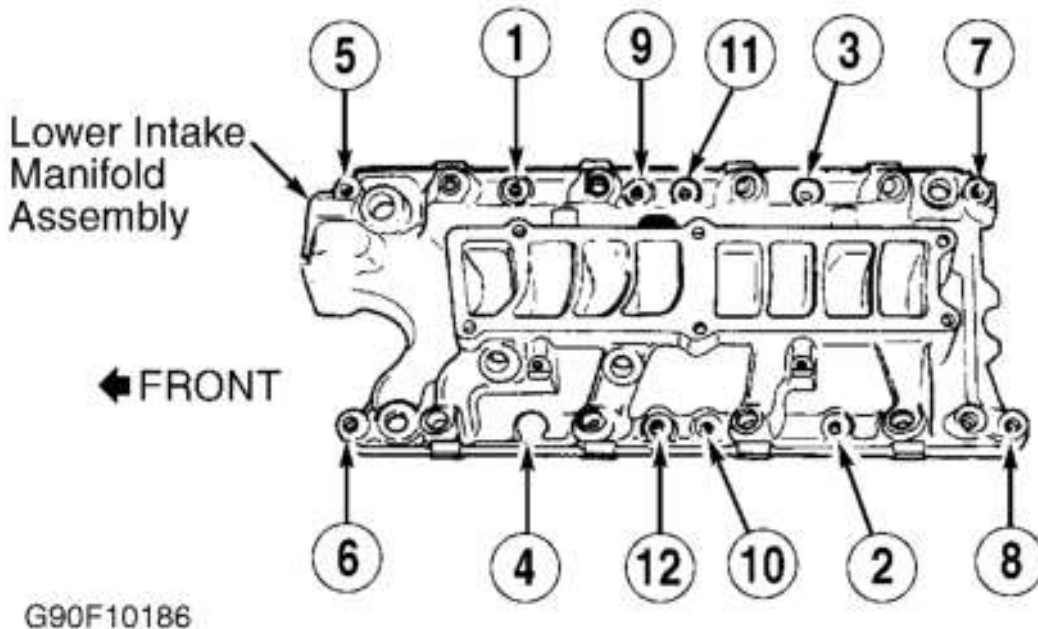


Fig. 3: Lower Intake Manifold Bolt Tightening Sequence
 Courtesy of FORD MOTOR CO.

EXHAUST MANIFOLD

Removal (Right)

1. Raise vehicle. Remove exhaust pipe-to-exhaust manifold nuts. Lower vehicle. On Van, remove

interior engine cover. On all models, remove air cleaner, intake duct assembly and crankcase ventilation hose.

2. Remove upper intake manifold support bracket and transmission dipstick tube bracket. Remove EGR valve assembly. Remove spark plug shield and right side exhaust manifold.

Removal (Left)

1. Raise vehicle. Remove exhaust pipe-to-exhaust manifold nuts. Lower vehicle. On Van, remove interior engine cover. On all models, remove air injection supply manifold (if equipped).
2. Remove nuts from lifting eye. Remove nuts and spark plug wire heat shield. Remove bolts and left manifold.

Installation

Ensure gasket mating surfaces are clean and flat. Install exhaust manifold and bolts. Tighten bolts, starting from center and moving outward, to specification. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure.

CYLINDER HEAD

Removal

1. Remove lower intake manifold. See **LOWER INTAKE MANIFOLD**. Remove valve cover(s). Remove drive belt. On Van, remove ignition coil. On all models, remove air cleaner duct. Disconnect exhaust pipe(s) from manifold(s).
2. To remove left cylinder head, remove A/C compressor (if equipped) and power steering bracket. Remove oil dipstick tube and speed control bracket (if equipped).
3. To remove right cylinder head, remove generator and air pump mounting bracket complete with accessories. Swing generator down and position aside.
4. To remove either cylinder head, loosen rocker arm bolts. Mark push rods for installation reference and remove. Disconnect air injection supply hoses at check valves, and plug check valve.
5. Remove cylinder head bolts in reverse order of tightening sequence. See **Fig. 4**. Remove cylinder head and gasket.

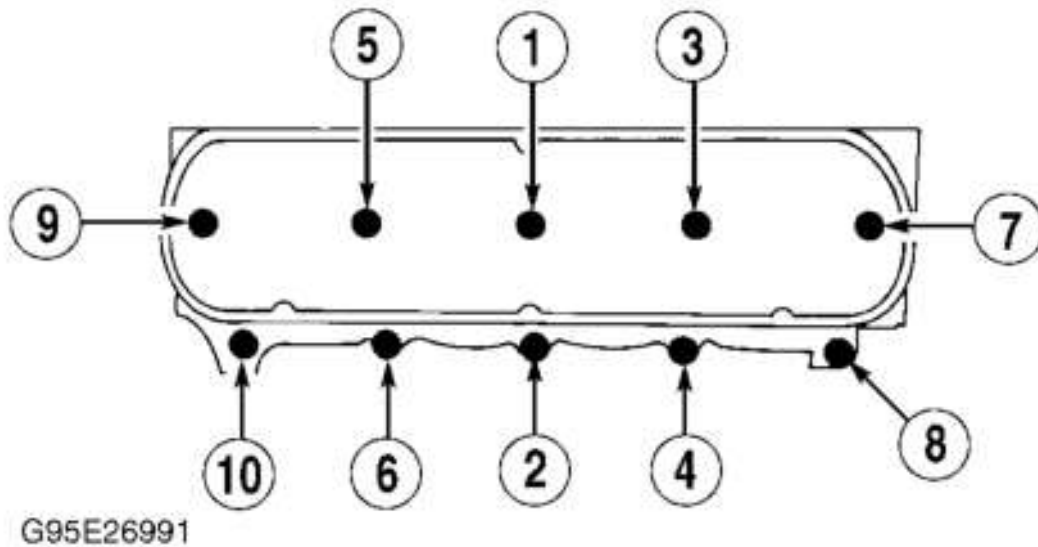


Fig. 4: Cylinder Head Bolt Tightening Sequence
 Courtesy of FORD MOTOR CO.

Inspection

Inspect cylinder head for cracks and warpage. Resurface if warpage exceeds specification. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS. DO NOT machine more than .010" (.25 mm) from original cylinder head thickness. Clean and tap cylinder head bolt holes in cylinder block.

Installation

CAUTION: If valves/seats were serviced, check and adjust valve clearance. See VALVE CLEARANCE ADJUSTMENT under ADJUSTMENTS.

1. Ensure gasket mating surfaces are clean and flat. Properly install NEW cylinder head gasket as marked on gasket. DO NOT use sealer on head gasket. Install cylinder head and bolts. Tighten bolts in sequence to specification. See **Fig. 4**. See **TORQUE SPECIFICATIONS**.
2. Lubricate push rod ends, valve stem tips, rocker arms and fulcrum seats with Multipurpose Grease (DOAZ-19584-AA). To complete installation, reverse removal procedure. Fill and bleed air from cooling system. See **COOLING SYSTEM BLEEDING**.

CRANKSHAFT FRONT SEAL

NOTE: Front seal can be replaced without removing front cover. Use Seal Remover (T70P-6B070-B) and Crankshaft Seal Installer/Cover Aligner (T88T-6701-A) to remove and install cover seal.

Removal

1. Remove fan shroud attaching bolts. Remove fan, clutch and shroud. Remove serpentine drive belt.

- Remove crankshaft pulley from the crankshaft vibration damper. Remove damper bolt and washer.
2. Remove crankshaft damper using Crankshaft Damper Remover (T79T-6316-A). Place Seal Remover (T70P-6B070-B) onto timing chain cover plate over front seal.
 3. Tighten 2 through-bolts, forcing seal remover under seal flange. Alternately tighten puller bolts one-half turn at a time until seal is removed from engine.

Installation

Coat NEW seal with grease. Using Seal Installer (T88T-6701-A), install NEW timing chain cover seal. Ensure seal is fully seated and spring is properly positioned in seal. To complete installation, reverse removal procedure. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS**.

TIMING CHAIN COVER

Removal (Bronco & Pickup)

1. Drain cooling system. Loosen fan clutch bolts. Remove fan shroud-to-radiator bolts (if equipped), and position shroud aside. Remove idler pulley belt. Remove all hoses and brackets attached to water pump.
2. Remove fan, clutch and pulley. Remove fan shroud (if equipped). Remove crankshaft pulley bolt. Remove crankshaft pulley. Remove crankshaft damper using Crankshaft Damper Remover (T79T-6316-A). Remove oil pan-to-cylinder block timing chain cover bolts. Remove timing chain cover and water pump as an assembly.
3. Cut oil pan gasket even with cylinder block. If replacement of timing chain cover seal is necessary, drive out old seal with pin punch. DO NOT damage timing chain cover seal recess.

Installation

1. Clean all gasket surfaces. If timing chain cover seal was removed, install NEW timing chain cover oil seal. Cut and fit NEW oil pan gasket. Apply sealer to oil pan gasket surface and install NEW gasket. Coat block and timing chain cover with gasket sealer, and position NEW gasket on block.
2. Place timing chain cover on cylinder block. Install Timing Chain Cover Aligner (T61P-6019-B). It may be necessary to force cover downward slightly to compress pan gasket. Coat timing chain cover bolts with oil-resistant sealer, and install bolts.
3. Tighten oil pan-to-timing chain cover bolts while pushing in on timing chain cover aligner. Tighten timing chain cover bolts. Remove aligner. To complete installation, reverse removal procedure. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS**. Fill and bleed air from cooling system. See **COOLING SYSTEM BLEEDING**.

Removal (Van)

1. Drain cooling system. Remove upper and lower radiator hoses. Remove radiator. Remove cooling fan and shroud. Raise vehicle on hoist. Remove A/C compressor, power steering pump bracket and accessories. Remove crankshaft pulley.
2. Remove crankshaft damper using Crankshaft Damper Remover (T79T-6316-A). Remove oil pan-to-timing chain cover bolts. Remove timing chain cover and water pump as an assembly.
3. If replacement of timing chain cover seal is necessary, drive out old seal with pin punch, taking care not to damage timing chain cover seal recess. Cut oil pan gasket even with cylinder block.

Installation

1. Clean all gasket surfaces. If timing chain cover seal was removed, install NEW timing chain cover oil seal. Cut and fit NEW oil pan gasket. Apply sealer to oil pan gasket surface and install NEW gasket. Coat block and timing chain cover with gasket sealer and position NEW gasket on block.
2. Place timing chain cover on cylinder block. It may be necessary to force cover downward slightly to compress pan gasket. Coat timing chain cover bolts with oil-resistant sealer, and install bolts.
3. Tighten oil pan-to-timing chain cover bolts. Tighten timing chain cover bolts to specification. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. Fill and bleed air from cooling system. See **COOLING SYSTEM BLEEDING**.

TIMING CHAIN & SPROCKET

Removal

1. Position No. 1 piston on TDC of compression stroke. Remove timing chain cover. See **TIMING CHAIN COVER**. Check alignment of camshaft and crankshaft sprocket timing marks. See **Fig. 5**. Check timing chain deflection.
2. If chain deflection is not within specification, replace timing chain and sprockets. See **CAMSHAFT** table under ENGINE SPECIFICATIONS. Remove camshaft sprocket bolt and washer. Slide sprockets and timing chain forward, and remove as an assembly.

Installation

Install crankshaft sprocket, camshaft sprocket and timing chain as an assembly. Ensure timing marks are properly aligned. See **Fig. 5**. Apply oil to timing chain and sprockets. To complete installation, reverse removal procedure. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS**.

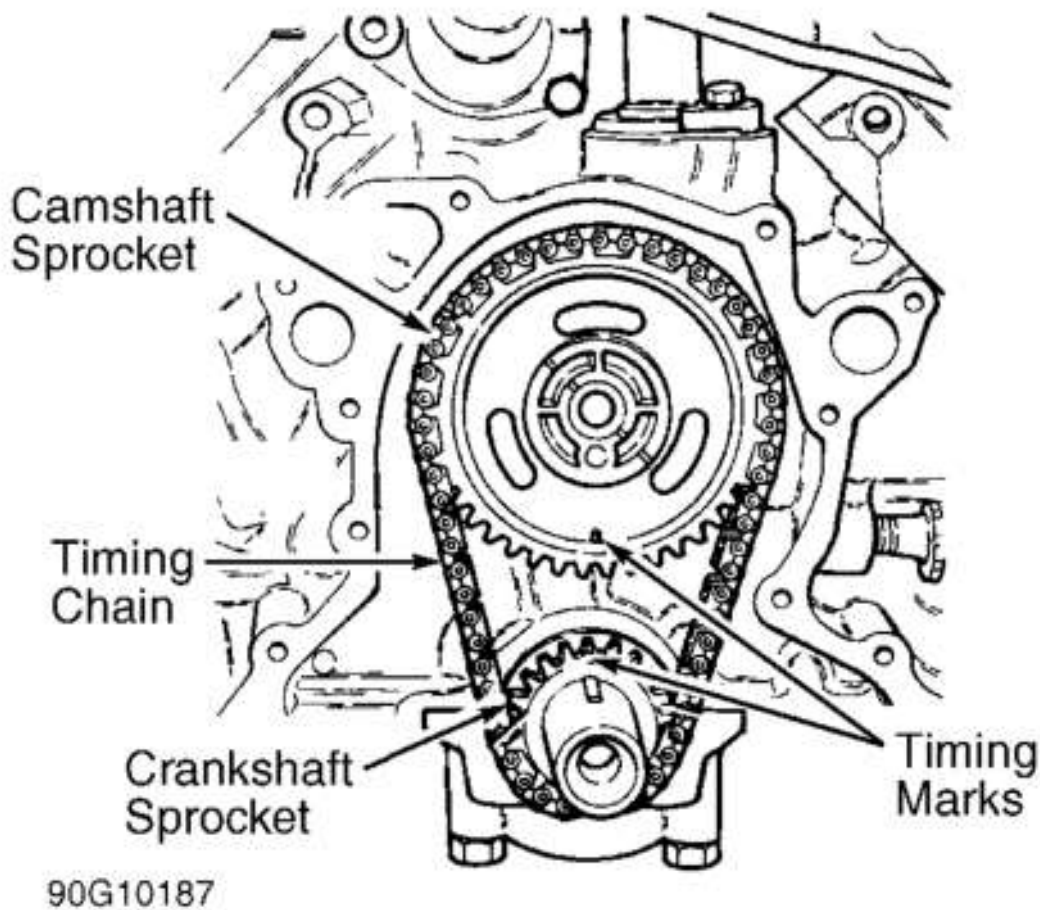


Fig. 5: Aligning Sprocket Timing Marks
 Courtesy of FORD MOTOR CO.

CAMSHAFT

Removal

1. On Van, remove front grille. On all models, drain cooling system. Disconnect upper and lower radiator hoses. Disconnect transmission oil cooler lines (if equipped). Remove radiator. Remove engine timing chain cover. See **TIMING CHAIN COVER**.
2. Remove timing chain. See **TIMING CHAIN & SPROCKET**. Remove upper intake manifold and throttle body as an assembly. See, in this article, **UPPER INTAKE MANIFOLD**. Remove valve covers.
3. Loosen rocker arm fulcrum bolts, and rotate rocker arms to one side. Mark and remove push rods and valve lifters for installation reference. Check camshaft end play. If not within specification, replace camshaft thrust plate. See **CAMSHAFT** table under ENGINE SPECIFICATIONS.
4. Remove camshaft thrust plate and remove camshaft. Use care to avoid damage to camshaft bearings and journals.

Inspection

Clean all components and gasket mating surfaces. Check lobe lift and camshaft-to-bearing clearance. See **CAMSHAFT** table under ENGINE SPECIFICATIONS.

Installation

1. Oil camshaft journals and apply multipurpose grease to lobes. Carefully slide camshaft into position. Coat camshaft thrust plate with engine oil, and install with groove toward cylinder block.
2. Lubricate lifters with engine oil and install in bores from which they were removed. Lubricate rocker arms, fulcrum seats, valve stem tips and push rod ends with multipurpose grease before installing.
3. To complete installation, reverse removal procedure using NEW gaskets. Check and adjust valve clearance as necessary. Refer to **VALVE CLEARANCE ADJUSTMENT** under ADJUSTMENTS.

CRANKSHAFT REAR OIL SEAL

Removal

1. Disconnect negative battery cable and remove starter. Remove transmission. Remove flywheel/flexplate and engine rear cover plate. Using a sharp awl, punch a hole into seal metal surface, between lip and block.
2. Using Carburetor Jet Plug Puller (T77L-9533-B), screw in threaded end of puller. Remove rear oil seal.

CAUTION: DO NOT scratch crankshaft or sealing surface during seal removal procedure.

Installation

Coat seal surfaces with light engine oil. DO NOT use grease for seal lubrication. Using Seal Installer (T82L-6701-A), install seal until firmly seated. To install remaining components, reverse removal procedure.

THERMOSTAT

For thermostat removal and installation, refer to **THERMOSTAT** .

WATER PUMP

Removal (Bronco & Pickup)

Drain cooling system. Loosen bolts on fan clutch. Disconnect fan shroud and position aside. Remove drive belt. Remove all hoses and brackets attached to water pump. Remove fan, fan clutch and fan shroud. Remove water pump pulley. Remove bolts attaching water pump to engine block.

Removal (Van)

Remove air cleaner duct assembly. Drain cooling system. Remove all hoses and brackets attached to water pump. Remove radiator. Remove drive belt, fan clutch and water pump pulley. Remove A/C compressor and power steering pump bracket. Remove bolts attaching water pump to engine block.

Installation (All Models)

Clean all gasket mating surfaces. Coat both sides of NEW gasket with gasket sealer. Install water pump and tighten bolts to specification. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. Fill and bleed air from cooling system. See **COOLING SYSTEM BLEEDING**.

OIL PAN

Removal (Bronco & Pickup)

1. Remove fan shroud. Remove upper intake manifold. Refer to **UPPER INTAKE MANIFOLD**. On A/T models, disconnect oil cooler lines from radiator. On all models, disconnect exhaust pipes from exhaust manifold. Remove front engine mounting nuts, and raise engine.
2. Drain engine oil. Support transmission and remove transmission crossmember. Remove oil pan bolts and lower oil pan. Remove oil pump bolts and pick-up tube nut. Lower oil pump assembly into pan. Remove oil pan from vehicle.

Installation

To install, reverse removal procedure. Apply silicone sealant at front and rear corners of oil pan surface and cylinder block, and where timing chain cover meets cylinder block. To install remaining components, reverse removal procedure.

Removal (Van)

1. Disconnect battery. Remove engine cover and air cleaner. Drain cooling system and engine oil. Remove auxiliary heater hoses (if equipped). Remove fan shroud and fan assembly. Remove oil filler tube. Disconnect radiator hoses. Remove oil dipstick tube bolts and remove dipstick. Remove power steering hose from steering gear.
2. Remove upper intake manifold. See **UPPER INTAKE MANIFOLD**. Raise and support vehicle. On A/T models, disconnect transmission cooler lines at radiator. Remove transmission dipstick and tube.
3. Disconnect exhaust pipes from manifold. On M/T models, disconnect manual linkage at transmission. Remove engine mount nuts. Place a jack with wooden block under oil pan near front of engine and raise engine.
4. Engine and transmission assembly must remain centered in engine compartment in order for it to be raised approximately 4" (120 mm) at front engine mounts. Use wooden blocks to support engine assembly in this position.
5. Remove oil pan bolts and lower oil pan onto crossmember. Remove oil pump bolts and lower oil pump assembly into pan. Remove oil pan and oil pump intermediate shaft.

Installation

1. Apply silicone sealant at front and rear corners of oil pan surface and cylinder block, and where timing chain cover meets cylinder block. Position NEW gasket and seals to engine block.
2. Position oil pan with pump to engine, and install oil pump. To complete installation, reverse removal procedure. Fill or top off all fluids. Fill and bleed air from cooling system. Refer to **COOLING SYSTEM BLEEDING**.